UNITED
NATIONS

A

General Assembly

Distr.
GENERAL

A/51/379
19 September 1996

ORIGINAL: ENGLISH

Fifty-first session
Item 12 of the provisional agenda*

REPORT OF THE ECONOMIC AND SOCIAL COUNCIL

Preventive action and intensification of the struggle against malaria in developing countries, particularly in Africa

Report by the Secretary-General

SUMMARY

Malaria continues to be most serious especially in developing countries and a major obstacle to their social and economic development. The malaria burden is considered to be greatest in Africa where an estimated 90 per cent of the global cases exist. Among the major contributing factors to the increase in the incidence of malaria are land degradation and deforestation. Military conflicts, civil unrest and internal and international movements of populations are also contributing to the burden of malaria, as large numbers of these groups of population move into malarious areas. Malaria itself reduces the working capacities of those infected, affects overall quality of life and undermines efforts at sustainable development.

Important developments have taken place at the national and international levels in the struggle against malaria. At the national level, efforts at capacity-building, training and drug and vaccine development are currently under way. Within the United Nations system of organizations, the System-wide Special Initiative on Africa, launched by the Administrative Committee on Coordination early in 1996, aims at strengthening the capacity of health systems and communities to reduce sustainably the major causes of morbidity

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and mortality, including malaria, and at intensifying coordination of activities between organizations of the United Nations system for malaria control.

However, the objective of reducing malaria mortality by the year 2000 by at least 20 per cent compared with 1995 in at least 75 per cent of affected countries would require the effective mobilization of necessary resources. The political commitment achieved so far for malaria control needs to be followed by a deeper commitment for the implementation and evaluation of national plans of action. The coordinated action of the health sector, other governmental sectors, the private sector and the community itself would need to be strengthened to reduce the malaria disease. At the intergovernmental level, especially at the regional and global levels, the commitment to a coordinated approach for combating malaria needs to be strengthened. Efforts will be needed to support system-wide activities that include malaria control as a priority.

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I. INTRODUCTION

Why malaria is a priority

1. Malaria is most serious in the poorest countries and among those living under the most difficult and impoverished conditions. It contributes in large measure to a vicious circle of disease - poverty - disease, and to the continued marginalization of peoples living in malarious areas. Malaria is increased by land degradation and deforestation; it reduces work capacities and undermines local efforts to live off the land in a sustainable manner. Malaria impairs physical and mental development in children, diminishes the returns achieved through education, and limits their potential to contribute fully to the social and economic growth of the country.

2. The most recent global estimate of malaria mortality and morbidity is from 1.5 million to 2.7 million deaths and from 300 million to 500 million sick annually; slightly more than 2 billion people are at risk. Some 90 per cent of the malaria burden is estimated to exist in Africa, south of the Sahara, almost all in the Plasmodium falciparum form, the parasite species associated with acute severity and mortality.

3. Malaria is one of the most serious health problems facing the countries in Africa and is a major obstacle to their social and economic development. Children under the age of five years and women in their first pregnancy are most vulnerable to the disease. Nearly 25 per cent of all childhood deaths in Africa and half of the fever episodes that African children under five years of age experience in endemic areas are attributable to malaria. Among African newborns, an estimated 3 million suffer complications from low birth weight, including deaths arising from maternal malarial infection during pregnancy. Malaria is also a major contributor to deaths owing to anaemia and malnutrition in young children.

4. Malaria is responsible for about 20 to 30 per cent of out-patient consultations and 10 to 15 per cent of hospital admissions in Africa. Among cases referred to hospitals with severe malaria, case fatality rates of 10 to 30 per cent have been noted, and the rates are even higher in rural and remote areas with little access to adequate treatment.

5. The disease is also one of the most common causes of school absenteeism. The United Nations Educational, Scientific and Cultural Organization (UNESCO) studies in rural endemic areas of Africa reveal that over a third of primary school children had malaria during the current school term, over half having had two or more attacks, typically missing a week or more of school with each attack.

6. Deaths from malaria in other areas of the world occur principally among non-immune people becoming infected with Plasmodium falciparum malaria in areas where appropriate diagnosis and treatment are not available. This, for instance, is the case for agricultural workers, labourers, gold and gem miners and refugees and displaced populations from non-endemic regions settling in malarious areas. The most severely affected are young adults, although in the

case of settlers the whole family might be exposed to the risk. The effects of malaria are especially noticeable in rural areas where malaria frequently strikes in the period of the year when there is greatest need for agricultural work, and when concentrated populations are attacked, as is often the case among the labour force in construction projects of one kind or another.

7. Most malarious countries, especially those in Africa south of the Sahara, do not and cannot know how many people die or are sick from malaria since malaria is most prevalent in those communities with poor access to health services and reporting systems may be poorly developed. What is known, however, is that the situation is worsening owing to increasing drug resistance (figure 1) and the growing number of epidemics (figure 2).

8. Chloroquine-resistant Plasmodium falciparum is intensifying and spreading in Africa in a significant number of countries. Moreover, rapid development of resistance to sulfadoxine/pyrimethamine has been already documented in Malawi and the United Republic of Tanzania. This will have a dramatic impact if the risk of infection remains high. The cost of treating malaria with anti-malarial drugs other than chloroquine, amodiaquine and sulfonamide-pyrimethamine is prohibitive for the large majority of the population in Africa.

9. An increasing number of epidemics have been documented in a number of countries. These are contributing to the worsening malaria situation in Africa, where some of the most severe malaria epidemics in recent years have taken place.

10. Military conflicts and civil unrest have contributed dramatically to the burden of malaria in the world, as large numbers of unprotected and non-immune refugees move into malarious areas. Less dramatic but no less important for the spread of malaria are the internal and international movements of populations, including economic and environmental refugees and migrants, into and out of malarious areas. Such population movements contribute to new outbreaks and make epidemic-prone situations more explosive.

11. Figure 2 portrays another disquieting fact, namely the reinvasion of malaria back into areas where malaria had been practically eradicated, such as Azerbaijan and Tajikistan. Also shown are epidemics in areas where malaria had been previously well under control, such as Iraq and Turkey. The current malaria epidemics in these countries are the result of a rapid deterioration of malaria prevention and control operations owing to military conflicts followed by economic crisis.

II. UNITED NATIONS SYSTEM ENDORSEMENT OF THE GLOBAL STRATEGY AND PLAN OF ACTION

12. The Global Malaria Control Strategy of the World Health Organization (WHO) 1/ was endorsed by ministers of health, health institutions and agencies concerned with health development at the Ministerial Conference on Malaria held at Amsterdam in October 1992. It has four technical elements:

(a) To provide early diagnosis and treatment;

(b) To plan and implement selective and sustainable preventive measures, including vector control;

(c) To detect early, contain or prevent epidemics;

(d) To strengthen local capacities in basic and applied research to permit and promote the regular assessment of a country's malaria situation, in particular the ecological, social and economic determinants of the disease.

13. The control strategy emphasizes the strengthening of local and national capabilities to analyse the malaria situation, to plan, implement and evaluate control interventions, and to contribute to health development in the context of primary health care. Training is the main instrument for capacity-building.

14. This strategy differs significantly from past approaches to the malaria problem, especially those used in the 1950s and 1960s when the eradication of malaria was attempted. While the eradication strategy relied heavily on the use of insecticides to reduce or interrupt malaria transmission and attempted to eliminate infection through case detection and treatment, using the same approaches in all areas, the current strategy aims to control malaria disease through early diagnosis and prompt treatment, including improving the management of severe and complicated malaria, controlling epidemics and using preventive measures that are locally effective and sustainable. The overall goal is the prevention of mortality and the reduction in morbidity and social and economic loss caused by malaria through the progressive improvement and strengthening of local and national capabilities for malaria control at national, district and community levels.

15. In 1993, the Economic and Social Council initiated a review of malaria responding to the concern expressed by members of the Council, especially those from countries in Africa south of the Sahara, that malaria was not receiving the urgent attention and funding needed from individual countries and from the United Nations system.

16. The Council's review led to the endorsement of the Global Malaria Control Strategy by the General Assembly at its forty-ninth session (resolution 49/135 of 19 December 1994). The Council continued with its review of the malaria problem in 1995, concentrating its attention on the Action Plan for Malaria Control (1995-2000), 2/ which emphasizes:

(a) Partnership among all United Nations organizations and other agencies involved in malaria control to ensure optimal technical cooperation with endemic countries;

(b) Planning region by region towards country-specific plans of action that are realistic, affordable and respond to national needs;

(c) Rapid application of technical developments and guidelines;

(d) Integration of malaria control activities with the general health services and other health programmes.

17. In its resolution 1995/63 of 28 July 1995, the Council endorsed the collaborative process of the United Nations system to control malaria and called for adequate financial resources for the prevention and control of malaria.

18. In its resolution 50/128 of 20 December 1995, the General Assembly again expressed its grave concern and alarm over the loss of life and degradation in the quality of life caused by malaria, while reaffirming its endorsement of the Global Strategy. It called upon the international community, in particular the donor countries, to expand, where possible, fund-raising channels and to provide adequate financial resources and medical and technical assistance to the affected developing countries, in particular African countries and least developed countries, for the successful implementation of work plans and projects and the achievement of significant progress in both the short and the medium term in controlling malaria, and to intensify basic and applied research on anti-malarial vaccines as a priority.

19. In the same resolution, the General Assembly encouraged the Director-General of WHO, through the WHO Division of Control of Tropical Diseases, to continue his efforts to mobilize international organizations, multilateral financial institutions, the specialized agencies, organs and programmes of the United Nations system and non-governmental organizations as well as other groups to provide the affected developing countries, in particular African countries, with technical, medical and financial resources and assistance commensurate with the needs set forth in those countries' national plans to control malaria. It also requested that the Secretary-General transmit to the General Assembly at its fifty-first session the progress report of the Director-General of WHO on the implementation of the strategies and work plans to be prepared in collaboration with the other relevant organs, organizations, bodies and programmes of the United Nations system.

20. The present report has been prepared to fulfil that request.

III. RECENT TECHNICAL DEVELOPMENTS

A. Technical cooperation with countries

21. The presence of a core group of health professionals in each malaria endemic country is a fundamental requirement for the planning, implementation and evaluation of national control programmes. In addition, capacity-building must permeate the whole health system for the success of the global action plan for malaria control to be realizable. Preliminary global estimations of training requirements have been made. These indicate that more than 800 programme managers, 1,500 specialists, 13,000 assistants, 55,000 workers at the district level and more than 120,000 community health workers are in need of training or retraining.

22. Training and capacity-building requirements and cost estimates are being continuously refined. To date a total of 43 countries have provided information concerning their needs. This involves the determination of categories and numbers of personnel who need to be trained, along with the content of training courses, the length of training required, and the materials that need to be

developed or acquired. Meeting the total estimated training requirements will require tens of millions of United States dollars, mostly to be mobilized from multilateral or bilateral sources. The WHO Division of Control of Tropical Diseases has developed the project Managing Tropical Diseases through Education and Understanding (MANTEAU), to develop training materials and strengthen educational approaches, including the application of modern computer learning technology. This project involves the European Commission, the United Nations Development Programme (UNDP), national academic institutions, agencies and industry. It links information with education through the management of people, data, programmes and resources and is based on the premise that good information and a well-trained workforce at all levels is the key to successful disease control.

23. To date, more than 240 managers from 49 African countries have had the opportunity to benefit from WHO international training courses. At least one person from all except five African countries has completed intensive training. These courses are designed to develop necessary skills required of those who will take on core group responsibilities in their countries. Many countries have several trained people. Over 150 trainers have been trained in Africa; they now have the responsibility for the country-level training of district health officers and their teams in malaria management and control. Nearly 10,000 trainees have been trained in malaria in courses that have been organized primarily at district and community level with priority being given to case management, i.e., early diagnosis and prompt treatment.

24. Along with capacity-building, technical cooperation and the mobilization of bilateral/multilateral funding for national programme implementation remain of priority importance. WHO is currently collaborating with UNICEF to strengthen the malaria programmes in Eritrea, Namibia, Uganda and the United Republic of Tanzania, with UNDP in Myanmar, with the World Bank in Bangladesh, Madagascar, the Lao People's Democratic Republic and Viet Nam, and with the European Commission in the development of a programme for malaria control for Cambodia, the Lao People's Democratic Republic and Viet Nam.

25. WHO has helped prepare project proposals, based on plans of action in 14 African countries (Benin, Burkina Faso, Cameroon, the Central African Republic, Eritrea, Ethiopia, Ghana, Madagascar, Namibia, the Niger, Uganda, the United Republic of Tanzania (Zanzibar), Zambia and Zimbabwe), for submission to different donors, and has provided technical and financial support to malaria control activities in 16 countries in Africa (Angola, Benin, Burkina Faso, Burundi, Chad, Ethiopia, Gambia, Guinea, Mozambique, the Niger, Nigeria, Rwanda, Togo, Uganda, Zambia and Zimbabwe). The funded activities include training of health workers at district level on malarial case management, production and distribution of health education materials, surveys to monitor the therapeutic efficacy of anti-malarial drugs, finalization of district plans of action for malaria control, national training workshops on selective vector control and promotion in selected areas of bednets impregnated with insecticide. Thirteen of these countries have been assisted further in the development of new national anti-malarial drug policies.

26. A Task Force on Malaria Control in Africa was established in 1995 made up of African and WHO experts in malaria, representatives of the United Nations

Children's Fund (UNICEF), UNDP and the World Bank, the United States Agency for International Development (USAID), the Overseas Development Administration of the United Kingdom of Great Britain and Northern Ireland, the Centers for Disease Control in Atlanta, Georgia, French and Belgium cooperation agencies, the African Development Bank and national programmes as well as representatives of regional and international technical bodies. A major purpose of this Task Force is to support the coordination of the different donors involved in malaria control and resource mobilization and to advise the WHO Regional Director for Africa on the most appropriate actions to be taken in order to strengthen malaria control programmes in the region. As follow-up to the recommendations made by the Task Force, six countries have started accelerating implementation of malaria control activities and eight others are in the process.

27. A meeting was organized by WHO and the World Bank in September 1995 on operational issues in malaria control. Representatives from Bangladesh, Brazil, Cambodia, Ethiopia, Ghana, India, Indonesia, Madagascar, Malawi, Senegal, Uganda and Venezuela participated. Its purpose was to identify and review systematically the major issues impeding malaria control, exchange experience in managing such problems and develop guidance to enable control programmes to move forward. The meeting also focused on how the two agencies could further promote concerted action and project development in those countries being assisted by the World Bank, and where malaria is a serious problem and an impediment to social and economic development. Another outcome was the initiation of a communications network through which information can be exchanged between control programmes. The network, on the Internet, will connect programme managers so that they can exchange information and experiences for managerial purposes. This network will facilitate support for programme implementation and joint-action on malaria control.

28. A meeting on insecticide-impregnated materials was held at the WHO Regional Office for Africa in March 1996 to promote the wider use of these materials in the countries focused also on community actions in the African region. At the meeting results of studies on the large-scale use of bednets treated with insecticide were reviewed, major issues relevant to wider promotion of bednets were discussed, along with some of the operational experiences, and major operational research priorities were identified. A basic scenario for the implementation of sustained malaria control involving the use of insecticide-impregnated mosquito nets and other materials was outlined. Draft guidelines have been prepared which cover specific policy, technical, managerial and operational issues that need to be addressed for the successful implementation of this control method. Initial focus in implementation will be in six countries (Kenya, Madagascar, Malawi, Namibia, Sao Tome and Principe and Zambia) that have incorporated this method in their plans for malaria control and in others in which bednet usage is relatively high.

29. Owing to the considerable overlap in signs and symptoms of the major diseases of childhood, of which malaria is one, a single diagnosis for a sick child is often inappropriate. A number of programmes in WHO and UNICEF have responded to the diagnostic challenge that this fact poses by developing an approach now referred to as the integrated management of the sick child. A fully integrated training package that addresses the different disease

conditions with feasible case management interventions has been developed by the relevant technical programmes and published in 1995.

30. WHO continues to provide technical and emergency assistance to countries/population groups facing epidemic/emergency situations, including the mobilization of funds and supplies. Such assistance is carried out in close cooperation with bilateral, international and non-governmental organizations. Support was rendered for malaria prevention and control in refugee camps in Azerbaijan, Burundi, Rwanda, the United Republic of Tanzania and Zaire and in countries and areas affected by epidemics (Azerbaijan, Bangladesh, Botswana, India, Iraq, the Sudan, Swaziland Tajikistan, Turkey, Yemen and Zimbabwe).

31. Guidelines on partnerships for change and communication for malaria programmes were published in 1996. These were developed in collaboration with the United Kingdom Malaria Consortium. Their aim is to help managers to define the malaria situation in their area and to develop strategies for health promotion and communication leading to community action suitable for that area. The guidelines are to be used by regional, provincial and district level managers of malaria programmes as well as by planners and trainers who assist and supervise district and/or community level programmes and personnel.

32. In 1996, WHO prepared and published guidelines concerning malaria control among refugees and displaced populations. These guidelines aim to help agencies, such as the Office of the United Nations High Commissioner for Refugees (UNHCR) and other organizations and non-governmental organizations that provide assistance to refugees and displaced populations in tropical countries to manage the malaria problems encountered in such situations. A similar manual is being finalized for malaria epidemic control.

B. Research

Impregnated bednets and other materials

33. Recent large-scale field trials in Africa, which were organized by the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR), took place in four African countries (Burkina Faso, the Gambia, Ghana and Kenya). They demonstrated an overall mortality reduction in children aged one to four years of 17-33 per cent, with an average of 25 per cent. Initial economic analysis indicates that the cost-benefit resulting from investments in nets would be comparable with global immunization programmes for tetanus, measles and poliomyelitis. These results confirm the important role of impregnated nets and other materials in Africa as a complementary tool to case management. Extensive work to translate these results into effective and sustainable programmes at the community level is currently under way.

Drug development

34. The efficacy of all existing anti-malarial drugs against *Plasmodium falciparum*, and therefore the provision of early diagnosis and prompt treatment in some areas, is compromised by problems of acquired drug resistance. Strains may be resistant to the majority of drugs. Particularly needed at the moment is

a replacement for quinine/tetracycline for severe malaria in areas of multidrug resistance and an inexpensive and safe chloroquine replacement for the treatment of uncomplicated malaria. Derivatives of artemisinin, a Chinese herbal medicine, appear most promising for the treatment of severe malaria, while various new drugs are being explored to replace chloroquine.

35. A new initiative, the Tropical Diseases Research and Development Alliance, has been launched by TDR to forge new partnerships with the private sector in order to bring in more resources, including professional staff and funds for operations. The major focus of this initiative is on anti-malarial drug discovery and development.

Vaccine development

36. The search for effective and affordable vaccines for malaria remains one of the most important aims for many research institutions. To date, results have been variable and somewhat disappointing. A trial in Gambia of the Colombian vaccine, SPf66, in the highest malaria risk group in Africa, i.e., children under the age of one year, did not confirm the 31 per cent efficacy reported in an earlier TDR-supported trial in the United Republic of Tanzania. A second phase III trial of this vaccine in the United Republic of Tanzania, also in children under the age of one year, is currently under way. Another trial in Thailand was completed in 1996 and results are to be published shortly. Other vaccine candidates are in both pre-clinical and early clinical development.

IV. RECENT GLOBAL POLICY DEVELOPMENTS

37. An important development that offers considerable promise for the future is the incorporation of malaria control into the ACC System-wide Special Initiative on Africa, which was launched by the Administrative Committee on Coordination on 15 March 1996. One of the four major themes of this Initiative, "New Hope for the Upcoming Generation", brings together basic education, health sector reform and employment and sustainable livelihoods. Health sector reform aims at strengthening the capacity of health systems and communities to sustainably reduce the major causes of morbidity and mortality, including malaria.

38. Another important step is the intensified cooperation between WHO and UNICEF in malaria control. A joint statement is in the process of being developed, in which collaboration is proposed in five to six countries of Africa south of the Sahara in a range of activities that include, inter alia, improving the ability of the general health services to manage malaria disease and developing effective mechanisms for emergency treatment of severe disease, improving the management of malaria disease within the community, protecting pregnant women from malaria, promotion of preventive measures and assisting in the rapid mobilization of human and financial resources to contain rapidly morbidity and mortality caused by epidemics.

39. In May 1996, the forty-ninth World Health Assembly adopted resolution WHA 49.11, in which it urged WHO to continue to provide, in collaboration with the United Nations agencies and programmes concerned, the technical expertise and support to the agreed malaria control strategies and workplans. In order to

strengthen further the malaria control programme at WHO, the Director-General has decided to establish a malaria prevention and control programme within the Division of Control of Tropical Diseases. Activities under this programme will be grouped under two primary functional areas: (a) country support; and (b) policy, information and surveillance.

40. In addition, the Director-General has decided to establish a task force to review the WHO Malaria Prevention and Control Programme and to recommend how the Programme could be strengthened. The task force will review the global malaria problem and the progress being made in the implementation of the strategy for its control; examine carefully the function and capacity of the WHO anti-malaria activities at all levels to identify strengths and weaknesses; and identify the technical, financial and operational constraints faced at the country, regional and headquarters levels. Progress in the implementation of the World Health Assembly's resolution WHA 49.11 will be presented to the WHO Executive Board at its session in January 1997.

V. CONCLUDING OBSERVATIONS AND RECOMMENDATIONS

41. The Action Plan for Malaria Control endorsed by the Economic and Social Council in 1995 (see para. 16 above) continues to serve as the basic document guiding international cooperation in malaria control for the period 1995-2000. However, while there is every degree of expectation that the main objective for 1997 that at least 90 per cent of countries affected by malaria implement appropriate malaria control programmes will be met, the objective for the year 2000, i.e., that malaria mortality will have been reduced by at least 20 per cent compared with 1995 in at least 75 per cent of affected countries, may be seriously jeopardized if countries cannot mobilize the necessary resources.

42. While "doing more with less", by better coordination, remains a central thrust of the Action Plan, there is no escaping the fact that the large gap between the resources needed and those in hand has not decreased. Malaria control remains vastly underfunded. If current funding shortfalls persist, there is even the danger that the momentum generated by the Ministerial Conference on Malaria in 1992 and the political interest of the Economic and Social Council, the General Assembly and the World Health Assembly will be lost.

43. What has been achieved to date is a political commitment to malaria control and a progressive creation of national and local capacities for assessing malaria situations and selecting appropriate measures aimed at reducing or preventing the disease in the community according to the Global Strategy. National plans of action have also been developed in many endemic countries. This now needs to be followed by a deeper commitment for the aggressive implementation and continuous evaluation of these plans. This requires not only the commitment of the health sector, but also other governmental sectors and the private sector where activities may directly or indirectly affect the malaria situation and the community itself. Only when these partnerships are strengthened and activities coordinated will future reports be able to indicate reductions in malaria disease and deaths.

44. Coordination within the United Nations system is taking place, especially at the country level, as reflected in the present report. Much more can be done, however, especially at regional and global levels. The General Assembly can help in this process by continuing to remind the world of its commitment to a coordinated approach to the Global Malaria Control Strategy and the Action Plan for Malaria Control. It can confirm the priority of malaria control by insisting that it be an integral part of all United Nations-wide initiatives that have as their aim human development, since human development is severely compromised where malaria is present. The Secretary-General's Special Initiative on Africa and the follow-up of recent United Nations conferences, in particular the 1992 United Nations Conference on Environment and Development, are particularly important in this regard. Also important is the full exploitation of existing intersectoral coordinating mechanisms, such as the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP), the United Nations Centre for Human Settlements (Habitat) and the WHO Panel of Experts on Environmental Management of Vector Control and the Africa 2000 initiative for water supply and sanitation.

Notes

1/ WHO, A Global Strategy for Malaria Control (Geneva, 1993).

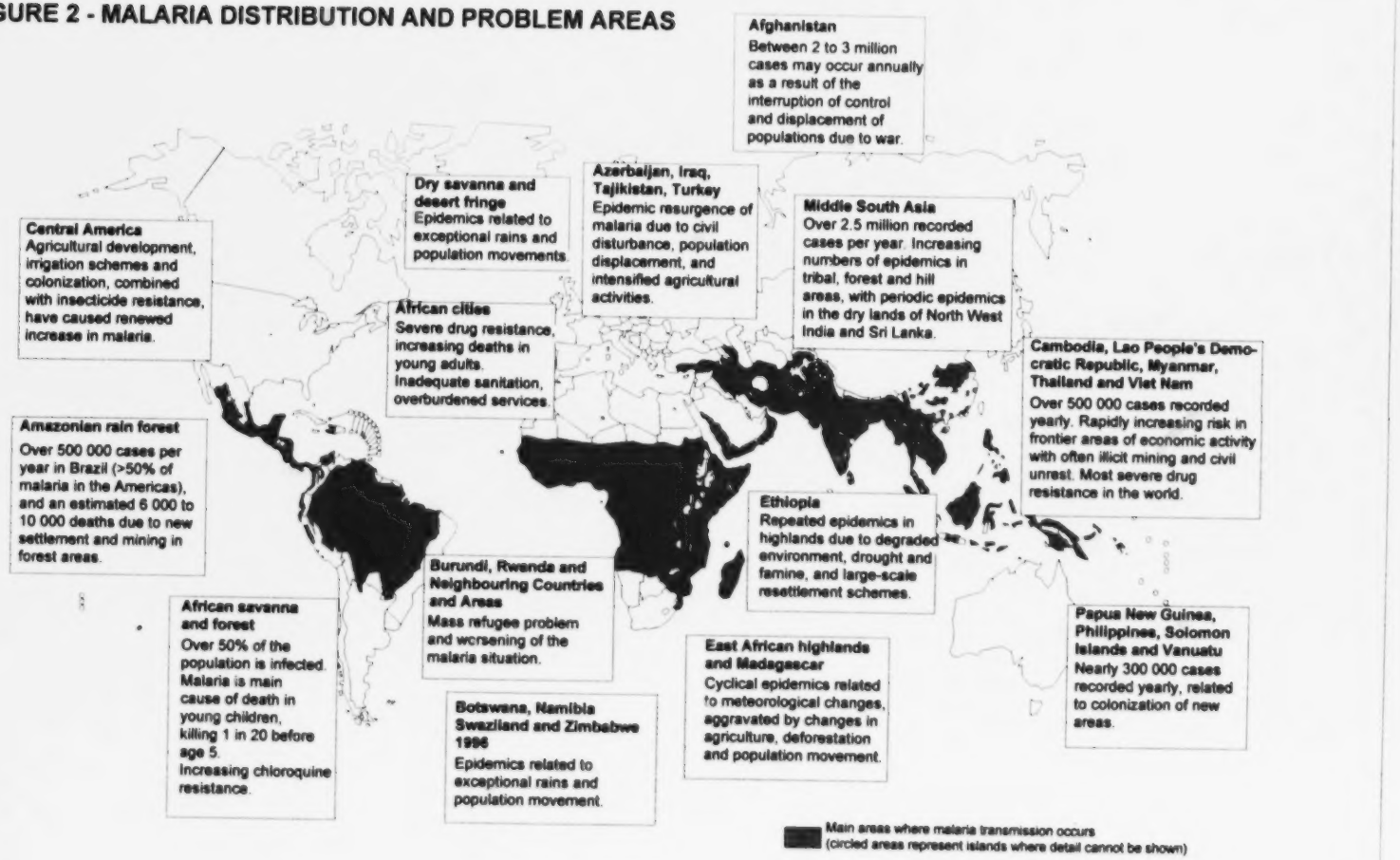
2/ WHO document CTD/MAL/95.2.

FIGURE 1 - MALARIA DISTRIBUTION AND REPORTED DRUG RESISTANCE

The designations employed and the presentation of material on the maps do not imply the expression of any opinion whatsoever on the part of the Secretariat of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries

WHO/CTD/HealthMap. 1996

FIGURE 2 - MALARIA DISTRIBUTION AND PROBLEM AREAS


Afghanistan
Between 2 to 3 million cases may occur annually as a result of the interruption of control and displacement of populations due to war.
Dry savanna and desert fringe
Epidemics related to exceptional rains and population movements.
Azerbaijan, Iraq, Tajikistan, Turkey
Epidemic resurgence of malaria due to civil disturbance, population displacement, and intensified agricultural activities.
Middle South Asia
Over 2.5 million recorded cases per year. Increasing numbers of epidemics in tribal, forest and hill areas, with periodic epidemics in the dry lands of North West India and Sri Lanka.
Central America
Agricultural development, irrigation schemes and colonization, combined with insecticide resistance, have caused renewed increase in malaria.
African cities
Severe drug resistance, increasing deaths in young adults.
Inadequate sanitation, overburdened services.
Cambodia, Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam
Over 500 000 cases recorded yearly. Rapidly increasing risk in frontier areas of economic activity with often illicit mining and civil unrest. Most severe drug resistance in the world.
Amazonian rain forest
Over 500 000 cases per year in Brazil (>50% of malaria in the Americas), and an estimated 6 000 to 10 000 deaths due to new settlement and mining in forest areas.
Ethiopia
Repeated epidemics in highlands due to degraded environment, drought and famine, and large-scale resettlement schemes.
Burundi, Rwanda and Neighbouring Countries and Areas
Mass refugee problem and worsening of the malaria situation.
African savanna and forest
Over 50% of the population is infected.
Malaria is main cause of death in young children, killing 1 in 20 before age 5.
Increasing chloroquine resistance.
East African highlands and Madagascar
Cyclical epidemics related to meteorological changes, aggravated by changes in agriculture, deforestation and population movement.
Papua New Guinea, Philippines, Solomon Islands and Vanuatu
Nearly 300 000 cases recorded yearly, related to colonization of new areas.
Botswana, Namibia Swaziland and Zimbabwe 1996
Epidemics related to exceptional rains and population movement.
Main areas where malaria transmission occurs
(circled areas represent islands where detail cannot be shown)

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WHO/CTD/HealthMap, 1996